CLAIMS

[1] A three-dimensional shape drawing device for drawing a three-dimensional shape by using Z buffer algorithm, the three-dimensional shape drawing device comprising:

a depth value calculation section for calculating a depth value of a pixel to be drawn;

a high order Z-buffer memory for retaining high order bits of a depth value of a pixel to be displayed as a front face, the depth value being among depth values having been calculated by the depth value calculation section;

a low order Z-buffer memory for retaining low order bits of the depth value of the pixel to be displayed as the front face, the depth value being among the depth values having been calculated by the depth value calculation section;

a high order bit comparing section for reading the high order bits retained by the high order Z-buffer memory and comparing the high order bits with high order bits of the depth value calculated by the depth value calculation section;

a low order bit comparing section for, when a result of a comparison performed by the high order bit comparing section shows that the high order bits of the depth value calculated by the depth value calculation section have a same value as that of the high order bits of the depth value retained by the high order Z-buffer memory, reading the low order bits of the depth value retained by the low order Z-buffer memory and comparing the low

order bits with low order bits of the depth value calculated by the depth value calculation section; and

a record update section for, when the result of the comparison performed by the high order bit comparing section shows that a depth indicated by the high order bits of the depth value calculated by the depth value calculation section is shallower than a depth indicated by the high order bits of the depth value retained by the high order Z-buffer memory, updating the high order bits of the depth value retained by the high order Z-buffer memory and the low order bits of the depth value retained by the low order Z-buffer memory by using the depth value calculated by the depth value calculation section, and for, when a result of a comparison performed by the low order bit comparing section shows that a depth indicated by the low order bits of the depth value calculated by the depth value calculation section is shallower than a depth indicated by the low order bits of the depth value retained by the low order Z-buffer memory, updating the low order bits retained by the low order Z-buffer memory by using the depth value calculated by the depth value calculation section.

[2] The three-dimensional shape drawing device according to claim 1, further comprising:

a pixel value calculation section for calculating a pixel value which is information about the pixel to be drawn; and

an image memory for retaining the pixel value calculated

by the pixel value calculation section.

[3] The three-dimensional shape drawing device according to claim 2, wherein the pixel value calculation section calculates the pixel value when the result of the comparison performed by the high order bit comparing section shows that the depth indicated by the high order bits of the depth value calculated by the depth value calculation section is shallower than the depth indicated by the high order bits of the depth value retained by the high order Z-buffer memory and when the result of the comparison performed by the low order bit comparing section shows that the low order bits of the depth value calculated by the depth value calculation section have a same value as that of the low order bits of the depth value retained by the low order Z-buffer memory.

[4] The three-dimensional shape drawing device according to claim 1, wherein the low order bit comparing section updates the low order bits retained by the low order Z-buffer memory when the low order bits calculated by the depth value calculation section have the same value as that of the low order bits retained by the low order Z-buffer memory.

[5] The three-dimensional shape drawing device according to claim 1, wherein when the result of the comparison performed by the low order bit comparing section shows that the low order

bits calculated by the depth value calculation section have the same value as that of the low order bits retained by the low order Z-buffer memory, the high order bit comparing section performs, for a next pixel, a comparison of high order bits of depth values.

[6] The three-dimensional shape drawing device according to claim 1, further comprising a high order Z-buffer clearing section for initializing the depth value retained by the high order Z-buffer memory with a predetermined value, wherein

the predetermined value indicates a shallowest depth or a deepest depth.

[7] The three-dimensional shape drawing device according to claim 1, further comprising:

a high order Z-buffer clearing section for initializing the depth value retained by the high order Z-buffer memory; and

a low order Z-buffer clearing section for initializing the depth value retained by the low order Z-buffer memory.

[8] The three-dimensional shape drawing device according to claim 1, wherein

when the depth indicated by the high order bits of the depth value calculated by the depth value calculation section is determined to be shallower than the depth indicated by the high order bits of the depth value retained by the high order Z-buffer

memory, the high order bit comparing section adds a flag to the high order bits of the depth value calculated by the depth value calculation section,

when the depth indicated by the low order bits of the depth value calculated by the depth value calculation section is determined to be shallower than the depth indicated by the low order bits of the depth value retained by the low order Z-buffer memory, the low order bit comparing section adds a flag to the low order bits of the depth value calculated by the depth value calculation section,

when the flag is added to the high order bits of the depth value calculated by the depth value calculation section, the record update section updates the high order bits of the depth value retained by the high order Z-buffer memory and the low order bits of the depth value retained by the low order Z-buffer memory, and when the flag is added to the low order bits of the depth value calculated by the depth value calculation section, the record update section updates either only the low order bits of the depth value retained by the low order Z-buffer memory or both the high order bits of the depth value retained by the high order Z-buffer memory and the low order bits of the depth value retained by the low order Z-buffer memory.

[9] The three-dimensional shape drawing device according to claim 1, wherein the high order memory and the low order memory

are physically separable.

[10] The three-dimensional shape drawing device according to claim 9, wherein the low order memory is physically separable from the three-dimensional shape drawing device.

[11] A memory used for the three-dimensional shape drawing device according to claim 1, the memory storing at least either one of high order bits and low order bits, the high order bits and the low order bits being separated as different bit strings.

[12] A three-dimensional shape drawing method for drawing a three-dimensional shape by using Z buffer algorithm, the three-dimensional shape drawing method comprising the steps of:

calculating a depth value of a pixel to be drawn;

reading, from a high order Z-buffer memory retaining high order bits of a depth value of a pixel to be displayed as a front face, the high order bits, the depth value being among depth values having been calculated at the step of calculating a depth value, and comparing the high order bits having been read with high order bits of the depth value calculated at the step of calculating a depth value;

when the high order bits of the depth value calculated at the step of calculating a depth value are determined, at the step of comparing the high order bits, to have a same value as

that of the high order bits of the depth value retained by the high order Z-buffer memory, reading, from a low order Z-buffer memory retaining low order bits of the depth value of the pixel to be displayed as the front face, the low order bits, the depth value being among the depth values having been calculated at the step of calculating a depth value, and comparing the low order bits having been read with low order bits of the depth value calculated at the step of calculating a depth value; and

updating the high order bits of the depth value retained by the high order Z-buffer memory and the low order bits of the depth value retained by the low order Z-buffer memory by using the depth value calculated by the step of calculating a depth value when a depth indicated by the high order bits of the depth value calculated at the step of calculating a depth value is determined, at the step of comparing the high order bits, to be shallower than a depth indicated by the high order bits of the depth value retained by the high order Z-buffer memory, and updating the low order bits retained by the low order Z-buffer memory by using the depth value calculated at the step of calculating a depth value when a depth indicated by the low order bits of the depth value calculated at the step of calculating a depth value is determined, at the step of comparing the low order bits, to be shallower than a depth indicated by the low order bits of the depth value retained by the low order Z-buffer memory.

[13] The three-dimensional shape drawing method according to claim 12, wherein when, at the step of comparing the low order bits, the low order bits calculated at the step of calculating a depth value are determined as having a same value as that of the low order bits retained by the low order Z-buffer memory, the low order bits retained by the low order Z-buffer memory are updated.

[14] The three-dimensional shape drawing method according to claim 12, wherein when, at the step of comparing the low order bits, the low order bits calculated at the step of calculating a depth value are determined as having a same value as that of the low order bits retained by the low order Z-buffer memory, a comparison of high order bits of depth values is performed for a next pixel.

[15] The three-dimensional shape drawing method according to claim 12, further comprising the steps of:

initializing the depth value retained by the high order Z-buffer memory; and

initializing the depth value retained by the low order Z-buffer memory.

[16] The three-dimensional shape drawing method according to claim 12, further comprising the step of initializing the depth value retained by the high order Z-buffer memory with a

predetermined value, wherein

the predetermined value indicates a shallowest depth or a deepest depth.